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(54) **Electronic counter measure system**

(57) A tactical electronic counter measure system comprising:

a first retro-directional transceiver sub-system, receiving signals at a first frequency band, said first retro-directional transceiver sub-system re-transmitting a signal at least substantially toward the direction from which the source signal was received, said first retro-directional transceiver sub-system including:

a plurality of antennas; and

a plurality of transceiver modules, at least one of said transceiver modules being defined as a reference transceiver module, said reference transceiver module includes:

a receiver, coupled with a respective one of said antennas, said receiver receiving a source signal from said respective one of said antennas; and

an amplifier, coupled with said respective one antenna, said amplifier receiving an intermediate signal, said amplifier amplifying said intermediate signal and providing said amplified phase shifted signal to said respective one antenna;

each one of the other transceiver modules include:

a receiver, to be coupled with one antenna other than said respective antenna, said receiver receiving a source signal from said at least one antenna;

a phase-shifter for shifting the phase of said intermediate

signal by a corresponding phase shift; and  
an amplifier, coupled with said respective one antenna and with said phase-shifter, said amplifier receiving a phase shifted signal from said phase-shifter, said amplifier amplifying said phase shifted signal and providing said amplified phase shifted signal to said respective one antenna;

a signal source generator, coupled with the receiver of said reference transceiver module, with the phase-shifter respective of said other transceiver modules and with the amplifier respective of said reference transceiver module, said signal source generator receiving the received signal respective of the receiver of said reference transceiver module, said signal source generator generating said intermediate signal according to said received signal; and

a relative phase determinator, coupled with each one of the receivers, and with each one of said phase-shifters, said relative phase determinator detecting the relative phase between said receiver of said reference transceiver module and each of the remaining ones of said receivers, said relative phase determinator further determines a phase shift associated with each of said phase-shifters and provides this determined phase shift to each of said phase-shifters, wherein, each one of at least two of said antennas transmits the respective amplified signal, thereby said antennas producing a retransmitted signal;

and  
a controller, coupled with said first retro-directional transceiver sub-system, said controller controlling the activity of said first retro-directional transceiver sub-system, said

controller further managing the tasks of said first retro-directional transceiver sub-system, said tasks at least including emitter acquisition.

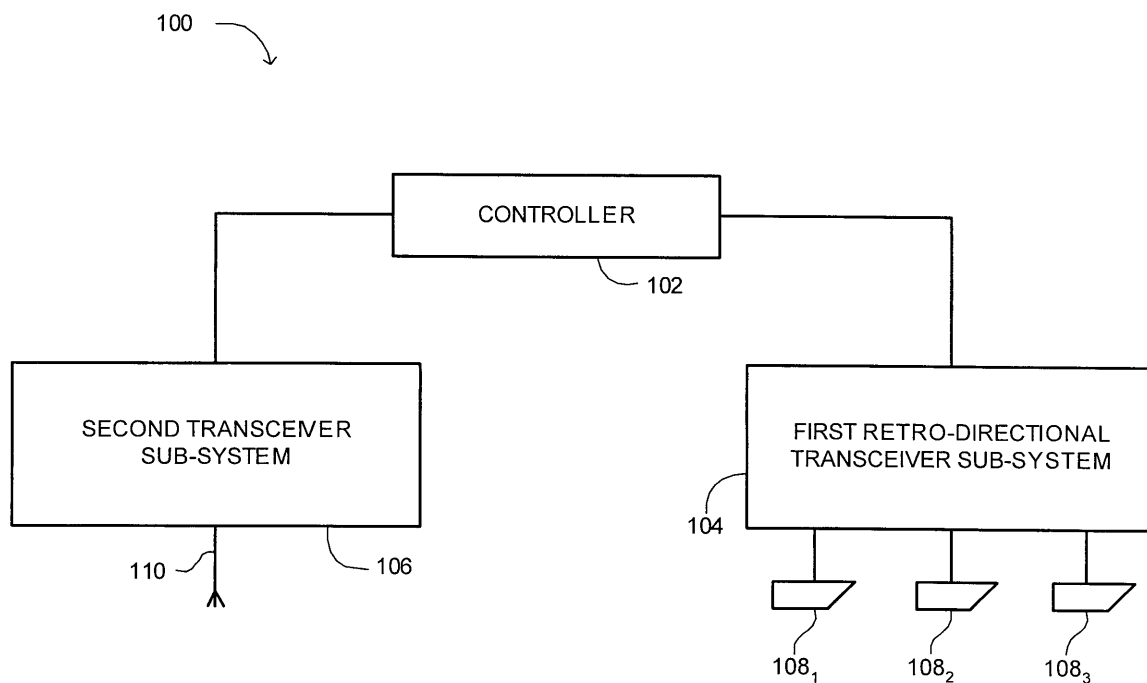


FIG. 1



## EUROPEAN SEARCH REPORT

Application Number  
EP 13 00 4209

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                     |                                  |                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Citation of document with indication, where appropriate, of relevant passages                                                       | Relevant to claim                | CLASSIFICATION OF THE APPLICATION (IPC) |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 6 297 762 B1 (LABITT BERNARD H [US])<br>2 October 2001 (2001-10-02)                                                              | 1,3                              | INV.<br>G01S7/38                        |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | * column 1, lines 1-8,16-22 *<br>* column 2, lines 33-61; figure 1 *<br>* column 3, lines 55-60 *<br>* column 4, lines 7-12,17-40 * | 2,4-15                           |                                         |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 2006/033655 A1 (QUIEVY DIDIER [FR])<br>16 February 2006 (2006-02-16)<br>* paragraphs [0028], [0030]; figure 2 *                  | 2                                |                                         |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GB 2 286 308 A (SECR DEFENCE [GB])<br>9 August 1995 (1995-08-09)                                                                    | 4-12                             |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | * the whole document *                                                                                                              | 1-3,<br>13-15                    |                                         |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | EP 0 898 174 A1 (FUJITSU LTD [JP])<br>24 February 1999 (1999-02-24)<br>* paragraphs [0057] - [0058]; figure 4 *                     | 13-15                            |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | US 5 623 270 A (KEMPKES MICHAEL A [US] ET AL)<br>22 April 1997 (1997-04-22)<br>* column 3, lines 37-63; figure 2 *                  | 1-15                             | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | EP 1 760 488 A1 (FUJITSU TEN LTD [JP])<br>7 March 2007 (2007-03-07)<br>* paragraph [0030]; figure 1 *                               | 13-15                            | G01S                                    |
| <p>2 <del>The present search report has been drawn up for all claims</del></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                     |                                  |                                         |
| Place of search                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                     | Date of completion of the search | Examiner                                |
| Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                     | 21 October 2013                  | Metz, Carsten                           |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons<br/>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                     |                                  |                                         |

EPO FORM 1503 03.82 (P04C01)



Application Number

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**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing claims for which payment was due.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

**LACK OF UNITY OF INVENTION**

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:
- 1-15
- ☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION  
SHEET B**

Application Number

EP 13 00 4209

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

**1. claims: 1-15**

Particular hardware implementations of a phase-shifter, signal source generator, phase shift determinator and switching scheme for a retro-directional tactical electronic counter measure system including multiple retro-directional transceiver sub-systems, which re-transmit amplified phase shifted signals through transceiver dedicated antennas, whereby the phase shifts between the signals are determined by means of a relative phase determinator, which determines the relative phase shift between the receivers of a reference transceiver module and each of the remaining other transceiver modules.

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**2. claims: 16-20**

A retro-directional tactical electronic counter measure system integrating a second transceiver sub-system, said which includes a communication and RADAR digital transceiver and a second communication transceiver.

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 13 00 4209

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-10-2013

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date                                                                                                                              |
|-------------------------------------------|---------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| US 6297762                                | B1                  | 02-10-2001                 | NONE                                                                                                                                             |
| US 2006033655                             | A1                  | 16-02-2006                 | EP 1570292 A1 07-09-2005<br>FR 2848302 A1 11-06-2004<br>US 2006033655 A1 16-02-2006<br>WO 2004053517 A1 24-06-2004                               |
| GB 2286308                                | A                   | 09-08-1995                 | NONE                                                                                                                                             |
| EP 0898174                                | A1                  | 24-02-1999                 | EP 0898174 A1 24-02-1999<br>EP 1914834 A2 23-04-2008<br>JP 3597678 B2 08-12-2004<br>JP H1164485 A 05-03-1999<br>US 5940029 A 17-08-1999          |
| US 5623270                                | A                   | 22-04-1997                 | NONE                                                                                                                                             |
| EP 1760488                                | A1                  | 07-03-2007                 | CN 1898578 A 17-01-2007<br>EP 1760488 A1 07-03-2007<br>KR 20060087606 A 02-08-2006<br>US 2007052581 A1 08-03-2007<br>WO 2005124388 A1 29-12-2005 |